THE PAPATACI FLIES (PHLEBOTOMUS) OF THE MALTESE ISLANDS.

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(Plates I.—III.)

(*A report of the twenty-third Expedition of the Liverpool School of Tropical Medicine.*)

Acting under the instructions of the Liverpool School of Tropical Medicine I proceeded to Malta on the 25th of June 1910, and stayed in the Island for a period of two months. The object of this expedition was to investigate the problems connected with the menace to health caused by the blood-sucking "Papataci Flies" of the genus *Phlebotomus*.* The greater part of my time was devoted to searching for the breeding-places of these insects with a view to devising practical prophylactic measures for the control of the pest. Other phases relating chiefly to the bionomics of *Phlebotomus* were also investigated; and attempts were made to rear the insect from the egg.

On making a critical examination of the material collected during the first week of my visit, two distinct species (*P. papatasii* Scop., and *P. pernicious*, sp. n.) were found to be almost equally abundant; and examples of a third, though apparently rare, species (*P. minutus*, Rond.) were subsequently taken. Since my return to England, Captain P. J. Marett, R.A.M.C., has very generously placed the whole of his collection of Maltese Papataci flies in my hands for examination and report; and among the numerous examples there were two specimens which have proved to be a new and hitherto undescribed species (*P. nigerrimus*, sp. n.), so that altogether four distinct species of *Phlebotomus* are now known to occur in the Maltese Islands.

These discoveries, though of much interest for the zoologist, add considerably to the labours of those who are or may be engaged in studying these insects more especially from a medical point of view; as owing to the minute morphological differences which exist between the females of these small midges the task of separating the respective species, more especially the commoner ones, is one which can be accomplished only after long and careful microscopical examination and comparison.

Hitherto the only species recorded from Malta was the common and widely distributed *P. papatasii*; but judging from recent experience, I have come to the conclusion that the almost equally abundant *P. perniciosus* must have been seen, though not recognised, by those who have been engaged in studying the bionomics of these insects.

It is highly probable too, that examples of this species were also used by those who conducted the transmission experiments, and although one has no direct proof, it is possible that *P. perniciosus*, like its near relative (*P. papatasii*), may also act as a carrier of Papataci fever.

* These insects are generally known to Englishmen as "Sand Flies."

The Search for Breeding-Places of Phlebotomus.

The results of my unremitting search for the breeding-places of these insects were that I secured two larvae from the crevices of the loose rock in the "caves" or catacombs at Notabile near the centre of Malta; thereby confirming the discoveries made by Captain Marett (6)* a month or so previously. Had my searches been continued in the same kind of habitat I have reason to believe that a few more larvae would have been secured, but having trained the eye so as to facilitate the finding of so minute an object the more readily on any future occasion, I proceeded in other directions, and searched innumerable places that were thought likely to form suitable breeding-grounds for these insects, unfortunately without discovering either eggs, larvae or pupae; disappointment met me at every turn and I am therefore unable to add anything that is new or noteworthy regarding the breeding-places of *Phlebotomus papatasii* or any of the allied species.

In addition to the cave from which larvae were secured I also inspected the places in which both larvae and pupae had been found by Captain Marett; these were the cave at Gozo, the embankment forming part of the Cottonera Lines, and the stone wall in Captain Marett's garden, which he had thoroughly explored and had also kept under close and constant observation for a considerable time. In all of these places the conditions were very similar, if not almost identical.

In the caves the larvae occurred in the crevices and fissures beneath the loose rock amongst the damp earth, &c., at some distance from the surface, and I was informed that those which were found in the stone wall, occurred low down near the foundations, well within the centre, and attached chiefly to the under surface of the stones; while those from the Cottonera embankment were found at some considerable distance from the surface, where the stones were damp (6).

The crevices between the loose rock in the caves were often found partly filled with soil rich in organic remains. In the caves at Notabile, in which the larvae were found, the soil had for the most part been reconstituted by the burrowing larvae of various insects and other allied animals. To such an extent had this been done in some instances that quite 50 per cent. of the deposit consisted of the rejectamenta of insects, woodlice (*Oniscus* sp.), &c. Here and there were found also large numbers of the empty pupae of *Stomoxys calcitrans* and the pupae of other Muscid flies whose larvae had matured in the stable refuse which had been stored in the cave for agricultural purposes.

In all of these places the conditions were practically the same, the three main factors being: (*a*) the presence of organic matter; (*b*) moisture, but not in excess; and (*c*) the absence of light.

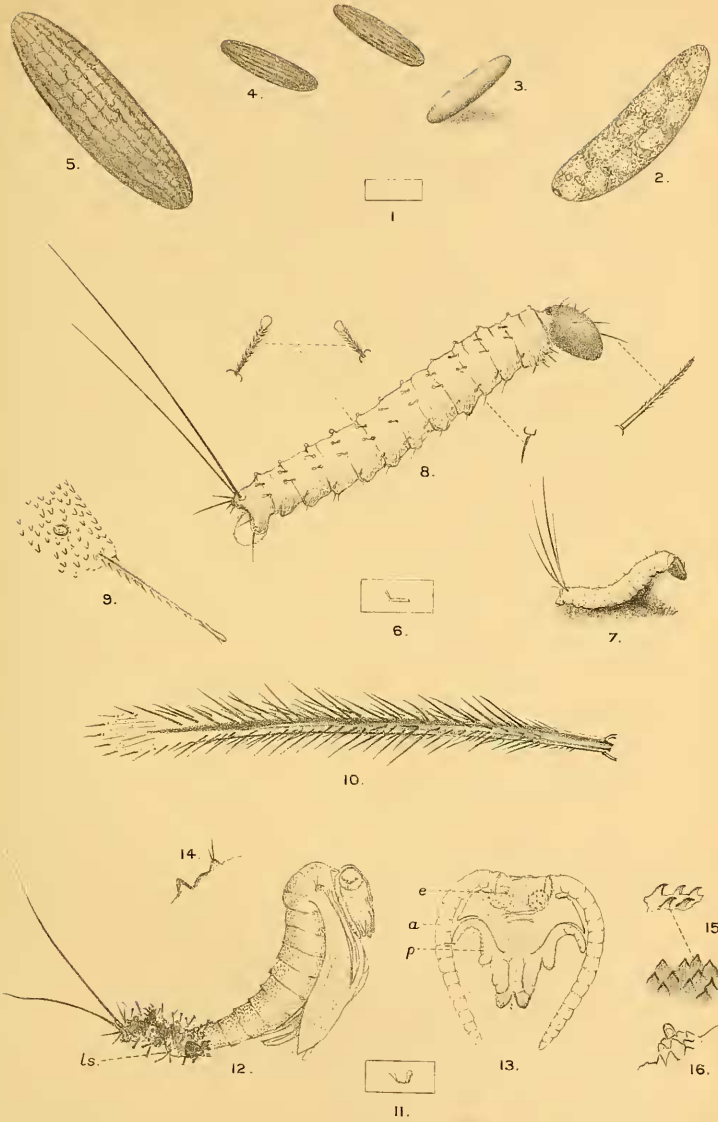
The principal places which were searched as being likely to afford suitable breeding-grounds for Papataci flies were as follows:—The main sewers and the ventilating shafts in various parts of the city of Valetta; drains of various kinds, cesspools and latrines in many places; cellars and prison cells in the Police Court; sewage works, and the dark damp buildings used by the Customs as

* Such numbers refer to the bibliography on p. 77.

EXPLANATION OF PLATE I.

Phlebotomus papatasii, Scop.

Fig. 1. Eggs, approximately natural size.
2. Egg, a few hours before extrusion, showing micropyle.
3. Egg, freshly extruded.
4. Egg, a few hours after extrusion.
5. Egg, much enlarged, to show reticulated surface.
6. Larva, approximately natural size.
7. Sketch of adult larva, enlarged.
8. Larva ; first instar, enlarged.
9. Stigma of larva with spine.
10. Hairy spine of larva.
11. Pupa, approximately natural size.
12. Pupa enlarged : *ls*, larval skin with anal bristles attached.
13. Front view of the head of the pupa : *e*, eye ; *a*, antenna ; *p*, palpus.
14. Thoracic tubercles of pupa.
15. Squamose body-spines of pupa.
16. One of the abdominal papillæ of the pupa.



R. Newstead, *ad. nat. del.*

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PHLEBOTOMUS PAPATASII

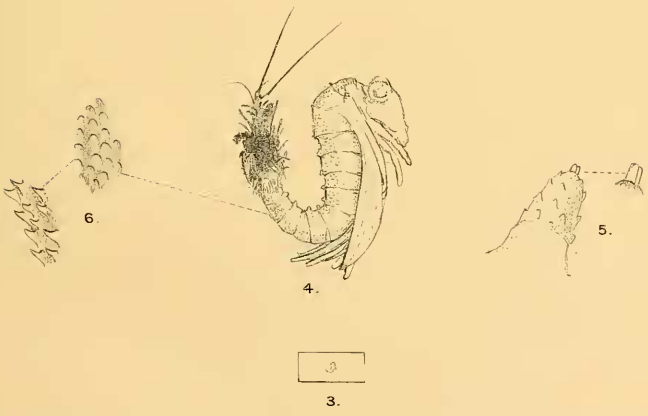
EXPLANATION OF PLATE II.

Phlebotomus papatasii, Scop.

Fig. 1. Imagos, approximately natural size.
2. Male, enlarged ; from life.

Phlebotomus perniciosus, Newst.

3. Pupa, approximately natural size.
4. Pupa, enlarged.
5. One of the abdominal tubercles of the pupa.
6. Squamose spines of the abdominal segments of the pupa.



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PHLEBOTOMUS PAPATASII AND P. PERNICIOSUS.

EXPLANATION OF PLATE III.

Fig. 1. *Phlebotomus papatasii*, Scop., female, enlarged ; from life.
2. *Phlebotomus perniciosus*, Newst., female, enlarged ; from life.
3. ,, ,, approximately natural size.

[NOTE.—The above enlarged figures and that of the male shown on Plate II. are all drawn to the same scale.]

1.

2.

3.

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PHLEBOTOMUS PAPATASII AND P. PERNICIOSUS.